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RICHMOND, VIRGINIA

To: . Those Listed   Date: February 21, 1979

From: . C. L. Irving

Subject: . Compacimetric Firmness Testing

In recent months many changes have been made to the equipment used for compacimetric firmness testing of cigarettes in the Materials Evaluation Facility. This memo is intended to make those people submitting cigarettes to the Materials Evaluation Facility aware of the current procedures for testing.

The current practice in the Materials Evaluation Facility (MEF) is to test cigarettes at five different tobacco weights, each usually 40 mg apart, of any blend (code) being evaluated. Therefore, when test cigarettes are ordered, it is customary to have them made to 5 tobacco weights, +40 and + 80 mg from a desired center weight. After cigarettes are submitted to MEF for testing, they are weight selected to within $\pm$ 5 mg of the five making weights using an automatic cigarette weight selector. This unit is accurate to within $\pm$ 1 mg. For compacimetric testing, 100 cigarettes are required of each weight after weight selection. This normally requires that 4,000 cigarettes (1 box) of each tobacco weight be given to MEF for testing. After weight selection, the cigarettes are put in screen bottom trays for equilibration. Equilibration requires about four hours in a specially designed cabinet which draws conditioned air at 75°F and 60% R. H. across the cigarettes. Throughout testing these temperature and relative humidity conditions are maintained. After equilibration is completed, ten cigarettes are measured for circumference and the average value is computed and stored by the compaciemter system microcomputer. The microcomputer has the capability of running a maximum of 44 codes, 5 weights each, at one time. After circumference values of all codes to be tested are entered, the microcomputer will randomly select a cigarette code and weight for the first compacimetric replication. Fifteen cigarettes of that code and weight are then weighed, to the nearest milligram, and the value stored by the microcomputer. Next, the cigarettes are put in the compacimeter, using the proper shim size for the circumference, and tested for firmness. This firmness value, to 0.1 firmness units (expressed in mm x 10), is also recorded by the microcomputer The cigarettes are then tested for moisture content using a Testron Moisture Meter. This procedure is followed for all codes and weights until five replications of each code and weight have been run. In addition, on the second and fourth replication

of each code and weight cigarettes are ripped for OV analysis after firmness testing. At the conclusion of cigarette testing, cigarette papers and filters are weighed for computation of tobacco weight. The microcomputer will then print out all data, by code, in a standardized format. Data is also transmitted from the microcomputer directly to the Sigma 9 computer for detailed data analysis by the submittor. Table 1 summarizes the compacimetric firmness testing procedure.

To assist the submittor in data analysis several computer programs are available from the Account.77 library written by Dr. H. A. Hartung. These programs enable the submittor to retrieve data from the file written by the compacimeter micro-computer and plot it as desired. The use of these programs in Account.77 is described in detail in references 1-3.

Normally, tests such as that described above are run to determine filling power differences between two or more blends. Using the equipment specified above, and single batches of filler differences in filling power of 2 to 3% are the smallest that can be detected. Consequently, if differences in filling power smaller than this are anticipated, it is necessary to make cigarettes using several levels of the component being evaluated and to predict filling power differences at the desired addition level. The customary way to analyze compacimetric firmness data is to plot firmness as a function of tobacco weight for the different blends being evaluated. Tobacco weights at a desired firmness can then be computed to determine filling power differences at equilibrium OV. An example of this is shown in Figure 1 where compacimetric firmness is plotted as a function of tobacco weight for two different blends. As illustrated, the difference in tobacco weight between blends A and B at a 33 mm x 10 firmness value is 33 mg or 4.4%.

If there are any questions or if help is needed to set up an experiment or evaluate data involving filling power please contact Mr. Fred Sherwood or Mr. Chris Irving.
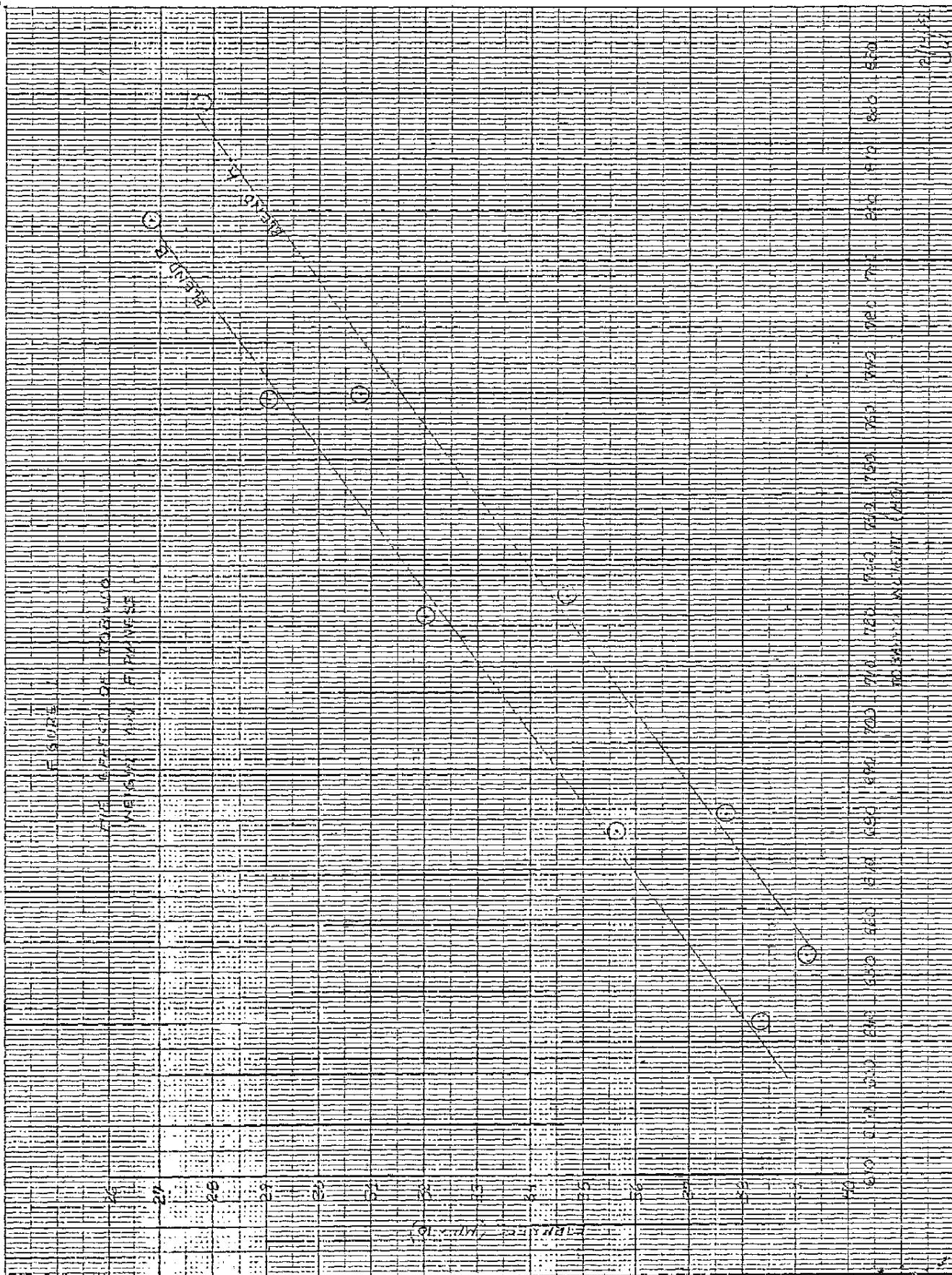
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TABLE 1

SUMMARY OF COMPACIMETRIC
FIRMNESS TESTING PROCEDURE

Number of cigarettes required for
weight selection per weight per code   4,000

Number of cigarettes required for
compacimetric testing per weight
per code after weight selection   100

Measurement	Number of Cigarettes per Determination	Number of Determinations per weight per code
1. Circumference	1	10
2. Cigarette weight	15	5
3. Compacimetric Firmness	15	5
4. Testron Moisture	15	5
5. Oven Volatiles	10	2
6. Paper and Filter Weight	10	1